

WHAT IS CLAIMED IS:

1 1. A digital multi-channel demodulator circuit for processing a multi-
2 channel analog RF signal, the multi-channel demodulator comprising:
3 a frequency-block down-converter configured to receive the analog RF signal
4 and to shift the analog RF signal to a lower frequency band;
5 an analog-to-digital converter (ADC) configured to receive the analog RF
6 signal from the frequency-block down-converter and to convert the analog RF signal to a
7 multi-channel digital RF signal; and
8 a digital channel demultiplexer configured to receive the digital RF signal
9 from the ADC and to demultiplex the digital RF signal into separate digital RF channels.

1 2. The circuit of claim 1 further comprising:
2 a selector configured to receive the separate digital RF channels and to select
3 one or more separate digital RF channels; and
4 one or more demodulators configured to receive one or more of the selected
5 digital RF channels from the selector and to demodulate the one or more selected digital RF
6 channels.

1 3. The circuit of claim 2 wherein each separate digital RF channel
2 comprises one or more data streams to be accessed or used by a subscriber.

1 4. The circuit of claim 2 wherein the one or more demodulators
2 demodulate only the RF channels that are selected by the selector.

1 5. The circuit of claim 2 further comprising a digital transport interface
2 configured to receive the selected RF channels from the one or more demodulators and to
3 output the selected RF channels.

1 6. The circuit of claim 1 further comprising a bandpass filter to reduce
2 aliasing from unwanted signals.

1 7. The circuit of claim 1 wherein the ADC is a high-speed ADC.

1 8. The circuit of claim 1 wherein the ADC converts an entire signal band,
2 the signal band including the multi-channel analog RF signal.

1 9. The circuit of claim 2 wherein the one or more demodulators share
2 resources.

1 10. The circuit of claim 1 wherein the digital channel demultiplexer
2 includes a digital tuner.

1 11. The circuit of claim 10 wherein the digital tuner comprises:
2 a numeric control oscillator (NCO) configured to generate a select frequency,
3 the select frequency being associated with a corresponding RF channel;
4 a complex multiplier configured to receive the digital RF signal and to
5 multiply the digital RF signal with the select frequency; and
6 a low-pass filter (LPF) configured to receive the digital RF signal and to pass
7 the corresponding RF channel.

1 12. The circuit of claim 11 wherein the LPF is a high-speed finite impulse
2 response (FIR) filter.

1 13. The circuit of claim 1 wherein the digital multi-channel demodulator
2 circuit processes downstream signals in at least one of a satellite system, a terrestrial TV
3 system, and a cable system.

1 14. A system using the circuit of claim 1 in combination with memory.

1 15. A system using the circuit of claim 1 in combination with a processor.

1 16. The circuit of claim 1 wherein the digital channel demultiplexer is a
2 polyphase channel demultiplexer.

1 17. The circuit of claim 16 wherein the polyphase channel demultiplexer
2 comprises:

3 one or more low-pass filters (LPF) configured to receive the multi-channel
4 digital RF signal and to synchronize the RF channels;

5 a discrete Fourier transform circuit (DFT) configured to receive the digital RF
6 signal and to demultiplex the digital RF signal into separate RF channels.

1 18. The circuit of claim 17 wherein the DFT is a combination of different
2 fast Fourier transforms.

1 19. The circuit of claim 17 wherein the polyphase channel demultiplexer
2 comprises at least two LPFs, the coefficients of each LPF filter being a part of a bigger low-
3 pass filter.

1 20. The circuit of claim 17 wherein the LPFs are low-speed finite impulse
2 response (FIR) filters.

1 21. A digital tuner for use in multi-channel demodulation, the digital tuner
2 comprising:

3 at least one numeric control oscillator (NCO) configured to generate a select
4 frequency, the select frequency being associated with a corresponding and separate RF
5 channel;

6 at least one complex multiplier configured to receive a multi-channel digital
7 RF signal and to multiply the multi-channel digital RF signal with the select frequency to
8 obtain the corresponding and separate RF channel.

9 at least one low-pass filter (LPF) configured to receive the digital RF signal
10 and to pass the corresponding RF channel.

1 22. The circuit of claim 21 wherein the LPF is a high-speed finite impulse
2 response (FIR) filter.

1 23. A polyphase channel demultiplexer for use in multi-channel
2 demodulation, the polyphase channel demultiplexer comprising:

3 a down-sample circuit that samples a multi-channel digital RF signal;

4 a plurality of low-pass filters (LPFs) configured to receive the multi-channel
5 digital RF signal and to synchronize the RF channels; and

6 a discrete Fourier transform circuit (DFT) configured to receive the multi-
7 channel digital RF signal and to demultiplex the multi-channel digital RF signal into separate
8 RF channels.

1 24. The circuit of claim 23 wherein the DFT is a combination of different
2 fast Fourier transforms.

1 25. The circuit of claim 23 wherein the polyphase channel demultiplexer
2 comprises at least two LPFs, the coefficients of each LPF filter being a part of a bigger low-
3 pass filter.

1 26. The circuit of claim 23 wherein the LPFs are low-speed finite impulse
2 response (FIR) filters.

1 27. The circuit of claim 23 wherein the polyphase channel demultiplexer
2 processes downstream signals in at least one of a satellite system, a terrestrial TV system, and
3 a cable system.

1 28. A method for demultiplexing a digital multi-channel RF signal into a
2 plurality of separate content channels, the method comprising:
3 down converting the multi-channel analog RF signal to a lower frequency
4 band
5 converting the multi-channel analog RF signal into a multi-channel digital RF
6 signal; and
7 demultiplexing the multi-channel digital RF signal into separate digital RF
8 channels.

1 29. The method of claim 28 further comprising receiving a plurality of
2 multi-channel analog RF signals.

1 30. The method of claim 28 further comprising selecting one or more
2 selected RF channels from at least one of the digital RF channels, each selected RF channel
3 being an RF channel containing one or more content channels to be accessed or used by a
4 subscriber.

1 31. The method of claim 30 further comprising demodulating the one or
2 more selected RF channels.

1 32. The method of claim 31 further comprising demodulating only the one
2 or more selected RF channels.

1 33. The method of claim 29 wherein the plurality of multi-channel analog
2 RF signals can be from at least one of a satellite system, a terrestrial TV system, and a cable
3 system.

1 34. The method of claim 28 wherein the demultiplexing further comprises:
2 providing a plurality of select frequencies, each select frequency being
3 associated with a corresponding and separate RF channel; and
4 multiplying the at least one multi-channel RF signal with each of the select
5 frequencies to obtain separate RF channels.

1 35. The method of claim 34 wherein the multiplying is achieved with a
2 complex multiplier.

1 36. The method of claim 34 further comprising shifting the target RF
2 channel to a baseband.

1 37. The method of claim 34 further comprising filtering undesired RF
2 channels and passing only the target RF channel.

1 38. The method of claim 37 wherein the filtering is achieved with a low-
2 pass filter (LPF).

1 39. The method of claim 38 wherein the LPF is a finite impulse response
2 (FIR) filter.

1 40. The method of claim 39 wherein the FIR filter is a high-speed filter.

1 41. The method of claim 34 wherein the select frequencies are generated
2 by numeric control oscillators.

1 42. The method of claim 28 wherein the demultiplexing further comprises:
2 synchronizing samples of the multi-channel RF signal using LPFs; and
3 shifting the frequencies of the RF channels.